Chapter 5. The Joint Commission's "Do Not Use" List: Brief Review (NEW)

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Introduction

Medication errors stem from a variety of causes, including miscommunication between prescribers and pharmacists in the form of misunderstood and/or illegible abbreviations. The potential hazards of certain abbreviations started receiving heightened attention approximately twenty years ago.[1] Most notably, as one of its National Patient Safety Goals, the then named Joint Commission on Accreditation of Healthcare Organizations (JCAHO, hereinafter referred to as the Joint Commission for consistency) in 2003 announced that nine abbreviations and/or shorthand notations—a Do Not Use list--should be banned in its accredited hospitals by April 2004.[2,3] The list included the following inappropriate abbreviations: "U" or "u" instead of unit; "IU" instead of International Unit; "Q.D." or similar instead of once daily; "Q.O.D" or similar instead of every other day, "MS", "MSO4" and "MgSO4" instead of writing morphine sulfate or magnesium sulfate; and use of zeros, either when trailing an ordinal number (1.0 instead of 1) or lack of a zero before a decimal point (.9 instead of 0.9)[2,4] (See Figure 1).

Figure 1, Chapter 5. Official "do not use" list

Official "Do Not Use" List[1]

Do Not Use	Potential Problem	Use Instead
U, u (unit)	Mistaken for "0" (zero), the number "4" (four) or "cc"	Write "unit"
IU (International Unit)	Mistaken for IV (intravenous) or the number 10 (ten)	Write "International Unit"
Q.D., QD, q.d., qd (daily)	Mistaken for each other	Write "daily"
Q.O.D., QOD, q.o.d, qod (every other day)	Period after the Q mistaken for "I" and the "O" mistaken for "I"	Write "every other day"
Trailing zero (X.0 mg)* Lack of leading zero (.X mg)	Decimal point is missed	Write X mg Write 0.X mg
MS	Can mean morphine sulfate or magnesium sulfate	Write "morphine sulfate" Write "magnesium sulfate"
MSO₄ and MgSO₄	Confused for one another	

[1] Applies to all orders and all medication-related documentation that is handwritten (including free-text computer entry) or on pre-printed forms.

*Exception: A "trailing zero" may be used only where required to demonstrate the level of precision of the value being reported, such as for laboratory results, imaging studies that report size of lesions, or catheter/tube sizes. It may not be used in medication orders or other medication-related documentation.

Additional Abbreviations, Acronyms and Symbols
(For possible future inclusion in the Official "Do Not Use" List)

Do Not Use	Potential Problem	Use Instead
> (greater than) < (less than)	Misinterpreted as the number "7" (seven) or the letter "L" Confused for one another	Write "greater than" Write "less than"
Abbreviations for drug names	Misinterpreted due to similar abbreviations for multiple drugs	Write drug names in full
Apothecary units	Unfamiliar to many practitioners Confused with metric units	Use metric units
@	Mistaken for the number "2" (two)	Write "at"
cc	Mistaken for U (units) when poorly written	Write "mL" or "ml" or "milliliters" ("mL" is preferred)
μg	Mistaken for mg (milligrams) resulting in one thousand-fold overdose	Write "mcg" or "micrograms"

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Figure taken from the JCAHO Web site.[4]

Avoiding potentially hazardous abbreviations was initially intended to pertain to handwritten documents (e.g., written prescriptions), but the over-riding plan was to extend this stipulation to all forms of patient-specific communications including printed, electronic or handwritten materials, with targeted compliance rates of 90% for handwritten and electronic formats and 100% for printed material by 2005.[2,8]

As part of the initial Joint Commission safety program, health care organizations were to add three abbreviations to their specific banned list, depending on the type of organization and their own experiences with abbreviation errors; the Joint Commission provided an additional list of abbreviations, symbols and acronyms for consideration.[4] The Joint Commission is not the only organization to provide lists or recommendations. The Institute for Safe Medication Practices provides an even more extensive list for consideration[5] and in 2006 began collaborating with the Food and Drug Administration to reduce hazardous abbreviations.[6,7]

The magnitude of harm due to abbreviations and other shorthand notations such as acronyms and symbols is not entirely clear. In a study completed after the Joint Commission's patient safety goal was disseminated, Brunetti et al., using data from the United States Pharmacopeia MEDMARX™ program— which in turn uses the National Coordinating Council for Medication Error Reporting and Prevention Index for Categorizing Medication Errors, found that between 2004 and 2006 a total of 29,974 medication errors out of 643,151 (4.7%) reported to the MEDMARX program were associated with abbreviations.[9] Of those with sufficient information to ascertain a description of the error (n = 18,153), about 43% were due to using the term "QD" (once daily). In addition, roughly 13% involved the abbreviation "U" (units), and approximately 13% "cc" (milliliter); nearly 10% used MSO4 or MS (morphine sulfate), and 3% "HS" (at bedtime); almost 4% were attributed to decimal errors (e.g., no leading zero or a trailing zero). Of the errors assessed, 0.3% led to patient harm, and most of those involved the abbreviation "U" in some manner.

Most errors (81%) occurred during prescribing; not surprisingly, medical staff were responsible for roughly 79% of abbreviation errors. Abbreviation use varied among staff groups, with physicians often using "sc", "hs" and "cc." While the study was limited by the constraints of voluntary reporting, the data suggest that relatively few abbreviations and notations are responsible for perhaps 5% of related medication errors—and this number may well be larger since not all errors are likely to be reported.

The purpose of this narrative literature review is to understand the degree to which health care organizations have succeeded in implementing procedures to prevent inappropriate abbreviations, and to identify which method(s) work well. We searched PubMed in October 2011 using major heading search terms "abbreviation and safe or unsafe or adverse or harm" for English language articles published starting in the year 2000. Titles and abstracts were retrieved, and relevant articles were retained for review. We expanded the search by using Google to search for possibly pertinent articles and links; we identified additional articles by looking at cited references from various publications. We focused on United States-based studies. Clinical trials, observational studies, reviews, and anecdotal reports on implementation were our primary resources and given priority in the order above.

What Are the Procedures for Reducing Prescribing Errors?

As Kuhn (2007) noted, there are three primary methods for addressing the safety issues posed by abbreviations: "education, enforcement and leadership."[8] In addition, the advent of electronic prescribing with clinical decision support may impact on abbreviation use.

Unfortunately, in all of these areas, the relevant United States' literature is sparse, and implementation efforts have had mixed results.

How Effective Have These Procedures Been?

Educating Providers to Reduce Potentially Unsafe Abbreviations. Abushaiqa et al. studied the strategy to decrease six specified unsafe abbreviations (unit instead of U; microgram instead of μg; 3 times a week for TIW; avoiding the degree symbol for hour, and avoiding trailing zeros and lack of leading zeros).[3] The setting was a 340-bed hospital in Detroit. Educational materials included pocket cards, chart dividers in patient charts, and traffic sign look-alike stickers. Providers were sent memorandums and electronic mail. In-service programs were also completed: prescribers using banned abbreviations or symbols were asked to clarify their orders and received instruction on why to avoid banned abbreviations.

The evaluation period, including a baseline assessment, lasted from September 2003 to April 2004. Unsafe abbreviations dropped from about 20% in the pre-intervention phase to about 3% by the end of the intervention period, with a total of over 20,000 orders reviewed. Sustainability of the program was not addressed, but the authors noted that in April 2004 the facility started utilizing the Joint Commission's Do Not Use list and in July 2004 the hospital no longer accepted orders with unsafe abbreviations.[3]

On the other hand, Garbutt et al. focused on 20 "safe prescribing behaviors" using a multi-faceted educational intervention at an urban teaching hospital in St Louis. The prescribing errors included dangerous abbreviations such as potential dosing errors (e.g., trailing zeros, leading zeros) and frequency measures (e.g., QD, QOD, TIW, HS). The intervention program included an academic component (e.g., grand rounds or lecture format) as well as reminders and prompts to emphasize desired prescribing practices. Overall, prescribing errors for surgical house staff declined but paradoxically increased for medical house staff. Notably, neither group decreased use of potentially hazardous abbreviations.[10]

Leonhardt and Botticelli studied an effort in Milwaukee, in 2003 to 2004, involving seven independent health care organizations.[11] The safety collaborative included local hospitals that partnered with the local business community as well as retail pharmacies. The goal was to completely eliminate nine abbreviations/shorthand notations from hospital medication orders and five abbreviations/shorthand notations from outpatient prescriptions (including abbreviations associated with units, once daily, every other day, trailing zeros and lack of leading zeros). Interventions and strategies included banning the prohibited abbreviations, educational programs (at various times during the intervention period) and providing informational materials (e.g., printed documents, wallet cards, posters); in addition, there was feedback to physicians who continued to use banned abbreviations. In outpatient clinics the intervention was passive education (i.e., newsletters).

The program improved prescribing for hospital-based medication orders but not for outpatient-based prescriptions. More specifically, appropriate documentation (i.e., no banned abbreviations or notations) rates, evaluated at thirteen hospitals, increased from approximately 62% at baseline to about 81% after the intervention (P < 0.0001). For clinic-based prescriptions, evaluated at nine retail pharmacies, rates of appropriate prescriptions increased a non-significant amount, from about 69% to 73% (P = 0.11).[11]

Leadership and Enforcement Effects on Abbreviation Use

We found no formal studies that isolated enforcement and/or leadership efforts, although the Abushaiqa study clearly included some enforcement. There were some anecdotal success stories, mostly after lack of success with educational programs. For example, at Children's Hospitals and Clinics in Minneapolis, prescribers were mandated to re-write orders with prohibited abbreviations; no details were provided on the magnitude of the effect(s). Another hospital in Tennessee contacted providers to ask for clarification of orders with designated abbreviations, and a medical staff chairperson discussed abbreviations with individual prescribers identified as using such; abbreviations in medication orders reportedly declined from around 30% to 6%. An Ohio hospital retrospectively routed prescriptions that contained designated abbreviations (apparently after filling the prescription) back to prescribers with feedback that the order had an unacceptable abbreviation(s). This program reportedly had "no noticeable decrease" in abbreviation use.[12]

Impact of Electronic Prescribing on Hazardous Abbreviations

Electronic prescribing provides a ready venue for focusing on abbreviation misuse. First, electronic prescribing eliminates illegible handwriting. Second, clinical decision support may be configured to prompt providers to avoid abbreviations and/or to auto-correct or translate abbreviations to preferred terms (e.g., using Q.O.D. would yield "every other day" on the prescription). However, there are limited data on how using electronic prescribing affects abbreviation use.

In a small study of faculty providers practicing in an outpatient setting, Galt et al. conducted a prospective, randomized controlled trial looking at how a personal digital assistant (PDA) affected prescribing by 78 office-based primary care physicians.[13] Practices were randomized to either usual handwritten prescribing or to entering prescriptions using a PDA-based clinical drug application. However, intervention offices could, when desired, use handwritten prescriptions. Duplicate prescriptions were gathered by printing an extra electronic prescription or by using carbon copies of written ones. The analysis compared the intervention group pre and post PDA use—that is, during the period when handwritten prescriptions were used, and then during the PDA use period, when physicians entered 43% of prescriptions via electronic means.

The study found that illegibility decreased from about 9% to 3% (though not to zero since not all prescriptions were via PDA) and, among other errors, various abbreviations and shorthand methods fell numerically (P-values not provided) including abbreviations for drug name (from about 3% to 2% of errors), administration route (from about 63% to 37%), frequency (from roughly 86% to 51%), and symbols on the prescription (from about 77% to 47%). In both time periods, issues with zeros were relatively rare ($< 1\%$); interestingly dosing abbreviations rose from 61% to approximately 71%, as some of these were allowed in the application.[13]

Devine et al. studied the impact of a basic computerized provider order entry program in a multispecialty clinic system in Washington State. Using a pre/post study design, evaluating handwritten (pre-intervention) prescriptions from January to March to 2004 and electronic prescriptions (post-intervention) from July 2005 to April 2006 at three retail pharmacies, they found that illegible prescriptions decreased from just under 3% to less than 0.1% and inappropriate abbreviations fell from around 5% to 0.4%.[14]

In a small prospective study of faculty providers practicing in an outpatient setting, Abramson et al. found that reducing abbreviation error rates was the primary driver in reducing overall prescribing errors when transitioning from an older to a newer electronic prescribing

system. The older, locally derived system had automatic conversion of inappropriate abbreviations installed on some computers; it also allowed for free text entries on the ordering template. It had minimal clinical decision support and did not send prescriptions directly to pharmacies. The newer system had a commercially available clinical decision support package, but did not auto-correct abbreviations. The system was able to send prescriptions to pharmacies. The newer system included two alerts to providers when they entered and completed a prescription containing an inappropriate abbreviation. In this yearlong study, data were available on seventeen physicians in the academically affiliated clinic. Rates of inappropriate abbreviations (per 100 prescriptions) fell from about 24 at baseline to just under 11 at 6 months and then to approximately 6 at 1 year after implementation (p-values < 0.001). Interestingly, non-abbreviation error rates rose at 12 weeks, but were similar at one year post-implementation.[15]

What Have We Learned About Procedures for Reducing Prescribing Errors?

The U.S. literature on programs designed to reduce prescribing errors is sparse. Studies that assessed the success of programs to educate providers report mixed results. We found no studies that focused specifically on enforcement or leadership, but anecdotal reports are also mixed. No studies address sustainability.

Electronic prescribing systems may hold promise. However the data on avoiding abbreviations are limited, and it is not clear which technology or technologies will work best for reducing shorthand methods of prescribing.

Conclusions and Comment

Abbreviations and other shorthand notations on prescriptions and orders increase the risk of medication errors, and the majority of errors and subsequent harms are caused by relatively few abbreviations or notations, and more specifically, "QD" (once daily), "U" (units), "cc" (milliliter); MSO4 or MS (morphine sulfate), and "HS" (at bedtime); in addition, decimal errors (e.g., no leading zero or a trailing zero) are also troublesome. Various organizations, most notably the Joint Commission in the form of its "Do Not Use" list, have taken a strong stand against using certain abbreviations. However, the available literature on various implementation efforts is limited, and no clear route to success has been described. Moreover, we found no studies that address sustainability of efforts and no studies on whether reducing abbreviations leads to less patient harms, though logically this would seem to be the case.

All in all, abbreviations can lead to misunderstandings and miscommunications between the prescribers and the pharmacists and in turn may lead to incorrect prescriptions being given to patients. Most errors are caused by relatively few abbreviations. Harms from such errors are uncommon but preventable. Although it is not clear how the Joint Commission's "Do Not Use" List (or any other list of hazardous abbreviations) can best be implemented across the spectrum of U.S. health care organizations it is important to note that there is no obvious patient harm to implementing such a list and data, to the extent that it exists, suggests that avoiding certain heightens prescribing safety. The cost and burden of implementation will depend on the stringency and/or comprehensiveness of the method(s) used. For example, electronic prescribing and decision support tools may offer the best chance of successfully reducing abbreviations on the "Do Not Use" list. However, it will take some time before prescribers are universally using

these systems and the cost and effort is not insubstantial to newly utilizing electronic prescribing. Another alternative would be enforcing a zero tolerance policy on handwritten prescriptions and medication orders. However, this might create a substantial burden for prescribers and pharmacists, particularly in the outpatient and retail pharmacy areas, not to mention mail out facilities. In the meantime, a low-cost approach of implementation, such as through ongoing education and/or feedback, focused on avoiding selected harmful abbreviations whenever and wherever possible seems reasonable and feasible. A summary table is located at Table 1, Chapter 5.

Table 1, Chapter 5. Summary table

Scope of the Problem Targeted by the PSP (Frequency/Severity)	Strength of Evidence for Effectiveness of the PSPs	Evidence or Potential for Harmful Unintended Consequences	Estimate of Cost	Implementation Issues: How Much do We Know?/How Hard Is it?
Common/Low	Low	Negligible	Low	Little/Probably not difficult

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